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## INSTITUTE OF ACTUARIES.

THE second year's examination has passed off satisfactorily. The degree of proficiency exhibited by the candidates both of the first and second year we understand to be very creditable. There can be no doubt that the advance made in the knowledge of the subject and of all matters connected with it is already considerable, and that the actuaries of the next generation bid fair to attain, and in all probability will attain, a more independent and influential position than their predecessors. Much has to be done, and many difficulties remain to be surmounted; nevertheless, the progress made is encouraging, and is well calculated to strengthen the hope of ultimate success, and of the attainment for the profession of that character and consideration which rarely fail to accompany superior and well directed knowledge.

We publish, by permission of the Council, the questions for the second year's examination, and also the programme for the third.\* They will be useful to the candidates of the present day, and will probably at a future one be looked back to with interest, as containing the germs of a better order of things then realized.

## SECOND YEAR'S EXAMINATION, 1853.

1. Express algebraically the arithmetical properties of logarithms.
2. Show that the logarithm of  $o$  is an infinite negative quantity.
3. How is it that the characteristics of common logarithms indicate the place of the decimal point in the corresponding natural number?
4. Give the series expressing a number in terms of its logarithm and the base of the system.
5. Give the series expressing the logarithm of a number in terms of the number itself, and the base of the system.
6. The number of cases in favour of the happening of three independent events being respectively  $n'$ , out of  $n$   $m'$ , out of  $m$  and  $p'$ , out of  $p$ ; required, the probability that in a given trial one event at least will happen out of the three.
7. All things being as before, required, that in the said given trial one event, and no more than one, will occur.
8. The probability of the happening of an event once in a single trial being  $n'$  out of  $n$ , state the probability of the same event happening twice, and twice only, in six consecutive trials.
9. A and B agree to play eight games at pitch and toss; what are the odds that B gains all, or all but one?
10. A bag contains six white and five black balls; what are the respective probabilities that of two drawings the results will be WB, WW, BW, BB, the first ball not being returned?
11. Determine the present value of an annuity of £1 per annum for 32 years, discounting at  $2\frac{1}{8}$  per cent. to four places of decimals.
12. Determine the amount of an annuity of £23 per annum, forborne at compound interest at 4 per cent. for 17 years.
13. Mr. Francis Baily, in page 86 of his *Treatise on Interest*, has given a formula for determining the amount of an annuity forborne for  $n$

\* This examination, we are authorized to state, will not take place till December, 1855.

years, which annuity is to commence with £1 per annum, and to increase by £1 per annum during the term; prove this to be correct or otherwise from first principles, and give the sum of the series in Mr. Baily's notation,  $1+i=x$ .

14.  $1+i=x$  as before: find the present value of £1 per annum, increasing £1 per annum for ever.

15. Describe Mr. Baily's method of finding the value of an annuity increasing £1 every year.

16. Find by the tables the value at 5 per cent. of an annuity for 3 years, increasing according to the order of the squares of the natural numbers.

17. Give the expression for the present value of £1 due  $n$  years hence, interest being convertible  $m$  times per annum.

18. Give the series expressing the value of  $\left(1+\frac{i}{m}\right)^{mn}$ , when  $m$  is infinite.

19. Define the difference between D'Alembert's theory, (as acted upon in the construction of Smart's and some other tables,) and the ordinary theory of compound interest.

20. By the ordinary theory, compound interest is never to be less than simple interest: show that, if  $i$  be the simple interest of £1 for a year, the compound interest for periods less than a year is less by D'Alembert's theory than the simple interest for such periods.

21. The value of an annuity at age  $x$  being  $A_x$ , and £1 increased by its interest for one year being  $1+i$ , and the numbers living in any table of mortality being respectively  $a_{x-1}$ ,  $a_x$ ,  $a_{x+1}$ , &c.; give the formula, quoted as Simpson's, but properly De Moivre's, for determining the value of  $A_{x-1}$ , and the method of constructing by such formula a table of the values of annuities,  $x$  being the oldest age in the table.

22. The notation being as in the foregoing question, show the construction of the usual columns D and N, as arranged by Davies and others.

23. Show that at any given age ( $x-2$ , for instance)  $\frac{N}{D} = A_{x-2}$ .

24. Explain briefly the methods of tabular construction pointed out by Mr. Peter Gray.

25. The value of an annuity on the life of A being  $A_x$ , and on the life of B being  $B_y$ , and on the joint lives being  $A_x B_y$ , state the value of an annuity during the life of the survivor.

26. Determine the value of an annuity deferred for  $n$  years on the longest of the two lives A and B.

27. The single premium for an assurance on the life A being added to the single premium for an assurance on the life B, and the single premium for an assurance on the joint lives of A and B being subtracted from the sum, the remainder will be the single premium on the longest of the two lives. Why will not a corresponding annual premium on the longest of the two lives result from a similar treatment of the annual premiums for the single and joint lives?

28. Notation as before, give the formula for the value of a reversion of £1 payable on the death of A, provided his life drop the first of three lives, A, B, and C.

29. Show the value of a reversion of £1 payable on the death of

A or B, if either of them should die first or second of three lives, A, B, and C.

30. Give the expression for the value of an annuity on the joint lives of C and the survivor of A and B.

#### PLAN OF THIRD YEAR'S EXAMINATION.

*As to construction of Tables of Mortality and Valuations (5 questions).*—Comparative advantages of the methods pursued by different writers.

*As to Legal Principles (5 questions).*—Deeds of settlement, Acts of Parliament, partnership *en commandite*, charters of incorporation; Joint Stock Companies, powers and duties of persons comprising them; policy considered as a contract; probates, and letters of administration; assignees and personal representatives.

*Statistical Principles (5 questions).*—Method for the arrangement and collection of data; comparative tests of accuracy; preparation of abstracts and reports.

*Political Arithmetic (5 questions).*—General system of the country's finance, funded and unfunded debt, and fiscal arrangements; taxation.

*Currency Arithmetic (5 questions).*—Currency, metallic and paper; bills of exchange; nature of banking—Bank of England, private, and Joint Stock Banks; comparative value of securities; operations of the Stock Exchange; high and low prices; rate of interest.

*Miscellaneous (5 questions).*—Office accounts, book-keeping, audit, correspondence, general routine, and approximate calculations.

*Books to be referred to.*—Milne, Gompertz, Davies, Farren, Bunyon, Dowdeswell, Smith's Wealth of Nations, Tooke on Prices, Newmarch on Supplies of Gold and on Bills of Exchange, McCulloch's Dictionary, Acts of Parliament relating to Banks and Banking, &c.

#### PROCEEDINGS OF THE INSTITUTE.

*First Ordinary Meeting, Session 1853-54.—Monday, 28th November, 1853.*

JOHN FINLAISON, Esq., President, in the Chair.

The Minutes of the last Annual General Meeting were read and confirmed.

The Secretary announced several donations to the Library.

The following Candidates, duly nominated at the last Ordinary Meeting, were elected Associates of the Institute, viz. :—

*Official Associate.*—F. A. Curtis.

*Associates.*

W. S. A. Cooper.

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William Gard.

Mr. Porter read a paper "On some points connected with the Education of an Actuary."

*Second Ordinary Meeting, Session 1853-54.—Monday, 2nd January, 1854.*

E. J. FARREN, Esq., Vice President, in the Chair.

The Minutes of the last Ordinary Meeting were read and confirmed.

The Secretary read the following extract from the Council Minutes, dated 3rd of November, 1853 :—

"Read the following letter from Professor De Morgan :—

“‘7, CAMDEN STREET, CAMDEN TOWN,  
“‘October 17th, 1853.

“‘MY DEAR SIR,—Among the papers of the late Francis Baily have been found the original manuscripts of his three works on subjects connected with the business of an Actuary—namely, of the first edition of the work on Leases, of the work on Interest, and of the work on Annuities, with the Appendix.

“‘Having been consulted on the disposal of these very interesting relics, I have recommended that they should be offered to the Institute of Actuaries, on condition that if the Institute, by dissolution or otherwise, should abandon the custody of them, they shall be returned to me, if I should be then alive ; and shall be presented to the library of the British Museum, if I should be then deceased.

“‘This recommendation having been acceded to, I am desired by Miss Baily, the sister of Mr. Baily, to offer the manuscripts to the acceptance of the Institute, on the condition above-named, which I have very great pleasure in doing.

“‘On being informed that this letter, together with a resolution of acceptance, is on the minutes of the Council of the Institute, I shall forthwith forward the manuscripts to the apartments of the Society.

“‘I remain, dear Sir,

“‘Yours very truly,

(Signed)

“‘A. DE MORGAN.

“‘John Finlaison, Esq.,

“‘Institute of Actuaries, St. James’s Square.’

“Resolved—That Professor De Morgan’s offer be accepted on the terms prescribed, and that the grateful thanks of the Council, on behalf of the Institute of Actuaries, be given to him for the very kind manner in which he has obtained for that body the custody of such interesting documents.

“Resolved—That Professor De Morgan be requested to express to Miss Baily the deep sense which the Council entertain of the favour thus conferred upon them by her, and to assure her of the watchful care that will be taken to preserve these memorials of works which, among others, have secured for their author so high a position amongst the philosophers and mathematicians of this country.

“Resolved—That a certified copy of the above resolutions be forwarded to Professor De Morgan.”

The following Candidates, duly nominated at the last Ordinary Meeting, were elected Members of the Institute :—

*Fellow.*—David Jones.

*Official Associate.*—Robert Christie, Jun.

*Associates.*

J. N. Harrington.  
Robert Hatton.  
George Humphreys.  
H. W. Kilburn.

Edward Nuth.  
D. R. C. Robinson.  
Charles Young.  
Samuel Younger.

The Chairman announced the result of the Annual Examinations in London and Edinburgh, by which it appeared that in London nine Candidates had presented themselves for the Second Year’s Examination, and had passed in the following order of merit, viz. :—

1. J. B. Haycraft,  
2. George Scott,  
3. E. H. Galsworthy,  
4. J. P. Laurence,  
5. John Coles,

6. Charles Watkins,  
7. Charles Griffiths,  
8. Thomas Carr,  
9. Thomas Miller, Jun. ;

and that out of eleven Candidates who had offered themselves for Matriculation Examination, eight had passed, their names appearing in the order of merit indicated :—

1. W. P. Pattison.	5. George Humphreys.
2. C. G. Fothergill.	6. J. B. Allan.
3. Samuel Younger.	7. D. R. C. Robinson.
4. Robert Hatton.	8. Edward Nuth.

In Edinburgh, two Candidates had presented themselves for their Second Year's Examination, and had passed, viz. :—

D. R. W. Huie, | James Wilson ;

and one for Matriculation Examination, and had also passed :

W. F. Birkmyre.

Mr. Jellicoe read a paper "On the Rates of Mortality prevailing amongst the Male and Female Lives assured in the Eagle Insurance Company during the 44 years ending 31st December, 1851."

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*Third Ordinary Meeting, Session 1853-54.—Monday, 30th January, 1854.*

PETER HARDY, Esq., Vice President, in the Chair.

The Minutes of last Ordinary Meeting were read and confirmed.

The Secretary announced several donations to the Library.

The following Candidates, duly nominated at the last Ordinary Meeting, were elected Associates of the Institute :—

*Official Associate.*—W. M. James.

*Associates.*

David Hall.	T. N. Oliver.
Leone Levi.	W. H. Preston.
Henry Mortlock.	

Monsieur Adolphe Quetelet was unanimously elected an Honorary Member of the Institute.

Mr. W. T. Thomson read a paper "On Decimal Coinage"; whereupon a discussion took place, in which Lord Overstone, Mr. Wood (Chairman of the Board of Inland Revenue), Dr. Gray, Mr. Hodge, Mr. Jellicoe, Mr. Farren, Mr. Hendriks, and others, took part, and which was adjourned to the next Meeting.

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*Fourth Ordinary Meeting, Session 1853-54.—Monday, 27th February, 1854.*

CHARLES JELlicoe, Esq., Vice President, in the Chair.

The Minutes of the last Meeting having been read and confirmed, the Secretary announced various donations to the Library.

Mr. Frederick Hann, duly nominated at the last Ordinary Meeting, was elected an Associate of the Institute.

The discussion on Decimal Coinage was renewed, the following gentlemen taking part in the discussion, viz. :—The Chairman, Mr. Lodge, Mr. Hill Williams, Mr. Brown, M.P. (Chairman of the Decimal Coinage Committee), Mr. Scott, Mr. Wood (Chairman of the Inland Revenue Board), and Mr. Hodge.

At the conclusion of the discussion, Mr. Hill Williams moved, and Mr. Tucker seconded, and it was unanimously resolved :—

"That this Meeting is of opinion that the plan recommended by the Decimal Coinage Committee of 1853 is the best that has been proposed, and that the Council be requested to prepare a petition to Parliament urging the adoption of that plan, with a recommendation for the issue of four-mil pieces as necessary for the protection of the interests of the poorer classes."

The thanks of the Meeting were then voted to Lord Overstone, Mr. Brown, M.P., and Mr. Wood, for the aid they had lent to the discussion, and the Meeting adjourned.

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